

FCC Test Report

Product Name	zoomBox
Model No.	ZB-DM-001
FCC ID.	2AJ4QZBP802C1G04GC0

Applicant	DIGIT MOBILE INC.
Address	5F, No. 550, Ruei Guang Rd., Nei Hu Dist., Taipei City 114, Taiwan

Date of Receipt	Oct. 13, 2016
Issued Date	Nov. 04, 2016
Report No.	16A0226R-RFUSP01V00-B
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

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Test Report

Issued Date: Nov. 04, 2016

Report No.: 16A0226R-RFUSP01V00-B



Product Name	zoomBox
Applicant	DIGIT MOBILE INC.
Address	5F, No. 550, Ruei Guang Rd., Nei Hu Dist., Taipei City 114, Taiwan
Manufacturer	ZINWELL CORPORATION
Model No.	ZB-DM-001
FCC ID.	2AJ4QZBP802C1G04GC0
EUT Rated Voltage	DC 5V, 2A
EUT Test Voltage	AC 120V/60Hz
Trade Name	zoomBox
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2015 ANSI C63.4: 2014, ANSI C63.10: 2013 KDB 558074 D01 DTS Meas Guidance v03r05
Test Result	Complied

Documented By : Anita Chou
(Senior Engineering Adm. Specialist / Anita Chou)

Tested By : Tom chiu
(Engineer / Tom Chiu)

Approved By : Vincent Lin
(Director / Vincent Lin)

TABLE OF CONTENTS

Description	Page
1. GENERAL INFORMATION	4
1.1. EUT Description.....	4
1.2. Operational Description.....	6
1.3. Tested System Details.....	7
1.4. Configuration of Tested System	7
1.5. EUT Exercise Software	7
1.6. Test Facility	8
1.7. List of Test Equipment.....	9
2. CONDUCTED EMISSION	10
2.1. Test Setup	10
2.2. Limits.....	11
2.3. Test Procedure	11
2.4. Uncertainty	11
2.5. Test Result of Conducted Emission.....	12
3. PEAK POWER OUTPUT	14
3.1. Test Setup	14
3.2. Limit	14
3.3. Test Procedure	14
3.4. Uncertainty	14
3.5. Test Result of Peak Power Output.....	15
4. RADIATED EMISSION	16
4.1. Test Setup	16
4.2. Limits.....	17
4.3. Test Procedure	18
4.4. Uncertainty	18
4.5. Test Result of Radiated Emission.....	19
5. RF ANTENNA CONDUCTED TEST.....	23
5.1. Test Setup	23
5.2. Limits.....	23
5.3. Test Procedure	23
5.4. Uncertainty	23
5.5. Test Result of RF Antenna Conducted Test.....	24
6. BAND EDGE	25
6.1. Test Setup	25
6.2. Limit	26
6.3. Test Procedure	26
6.4. Uncertainty	26
6.5. Test Result of Band Edge	27
7. 6DB BANDWIDTH.....	33
7.1. Test Setup	33
7.2. Limits.....	33
7.3. Test Procedure	33
7.4. Uncertainty	33
7.5. Test Result of 6dB Bandwidth.....	34
8. POWER DENSITY	37
8.1. Test Setup	37
8.2. Limits.....	37
8.3. Test Procedure	37
8.4. Uncertainty	37
8.5. Test Result of Power Density	38
9. EMI REDUCTION METHOD DURING COMPLIANCE TESTING	41
Attachment 1: EUT Test Photographs	
Attachment 2: EUT Detailed Photographs	

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	zoomBox
Trade Name	zoomBox
Model No.	ZB-DM-001
FCC ID.	2AJ4QZBP802C1G04GC0
Frequency Range	2402 – 2480MHz
Channel Number	V4.0: 40CH
Type of Modulation	V4.0: GFSK(1Mbps)
Antenna Type	PIFA Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”
HDMI Cable	Non-shielded, 1.5m
Bluetooth Speaker	Trade :Jabra Model :PHS002W (FCC ID:BCE-PHS002W)
Power Adapter	MFR: APD, M/N: WE-10E05FU Input: AC 100-240V ~ 50-60Hz Output: DC 5V, 2A
Contain Module	AMPAK/AP6212

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	zoomBox	I30	PIFA Antenna	3.1dBi for 2.4 GHz

Note: The antenna of EUT is conforming to FCC 15.203.

Center Frequency of Each Channel: (For V4.0)

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00:	2402 MHz	Channel 01:	2404 MHz	Channel 02:	2406 MHz	Channel 03:	2408 MHz
Channel 04:	2410 MHz	Channel 05:	2412 MHz	Channel 06:	2414 MHz	Channel 07:	2416 MHz
Channel 08:	2418 MHz	Channel 09:	2420 MHz	Channel 10:	2422 MHz	Channel 11:	2424 MHz
Channel 12:	2426 MHz	Channel 13:	2428 MHz	Channel 14:	2430 MHz	Channel 15:	2432 MHz
Channel 16:	2434 MHz	Channel 17:	2436 MHz	Channel 18:	2438 MHz	Channel 19:	2440 MHz
Channel 20:	2442 MHz	Channel 21:	2444 MHz	Channel 22:	2446 MHz	Channel 23:	2448 MHz
Channel 24:	2450 MHz	Channel 25:	2452 MHz	Channel 26:	2454 MHz	Channel 27:	2456 MHz
Channel 28:	2458 MHz	Channel 29:	2460 MHz	Channel 30:	2462 MHz	Channel 31:	2464 MHz
Channel 32:	2466 MHz	Channel 33:	2468 MHz	Channel 34:	2470 MHz	Channel 35:	2472 MHz
Channel 36:	2474 MHz	Channel 37:	2476 MHz	Channel 38:	2478 MHz	Channel 39:	2480 MHz

Note:

1. The EUT is a zoomBox with a built-in WLAN 、Bluetooth V3.0, V2.1+EDR,V4.0 transceiver, this report for Bluetooth V4.0.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of Bluetooth transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode	Mode 1: Transmit - BLE (GFSK)
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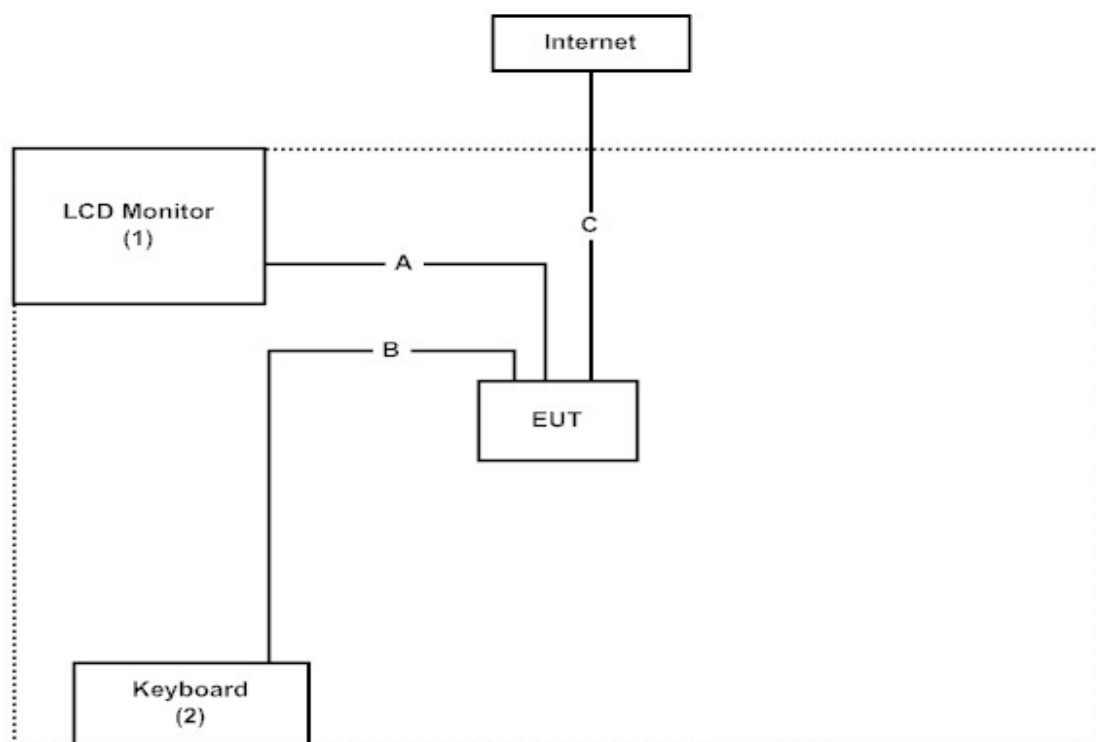
1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
1 LCD Monitor	ASUS	VS229HA	F4LMQS135395	Non-Shielded, 1.8m
2 Keyboard	DELL	SK-8115	MY-0DJ325-71619-6A3-1913	N/A

Signal Cable Type	Signal cable Description
A HDMI Cable	Non-shielded, 1.5m
B USB Cable	Shielded, 1.0m, with one ferrite core bonded.
C LAN Cable	Non-shielded, 2.5m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4.
2. Execute software “ RF TestTool V5.5” on the EUT.
3. Configure the test mode, the test channel, and the data rate.
4. Press “OK” to start the continuous Transmit.
5. Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	30-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site: <http://www.quietek.com/chinese/about/certificates.aspx?bval=5>

The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site: <http://www.quietek.com/>

Site Description: File on
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Registration Number: 92195

Site Name: Quietek Corporation
Site Address: No.5-22, Ruishukeng,
Linkou Dist. New Taipei City 24451,
Taiwan, R.O.C.
TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : service@quietek.com

FCC Accreditation Number: TW1014

1.7. List of Test Equipment

For Conducted measurements /CB3/SR8

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Spectrum Analyzer	Agilent	N9010A	MY48030495	2016/7/22	2017/7/21
X	Power Meter	Anritsu	ML2495A	6K00003357	2016/6/23	2017/6/22
X	EMI Test Receiver	R&S	ESCS 30	100369	2016/10/13	2017/10/12
X	LISN	R&S	ESH3-Z5	836679/017	2016/1/7	2017/1/6
X	LISN	R&S	ENV216	100097	2016/1/7	2017/1/6
X	Coaxial Cable	QTK(Arnist)	RG 400	LC018-RG	2016/6/25	2017/6/24

For Radiated measurements /Site3/CB8

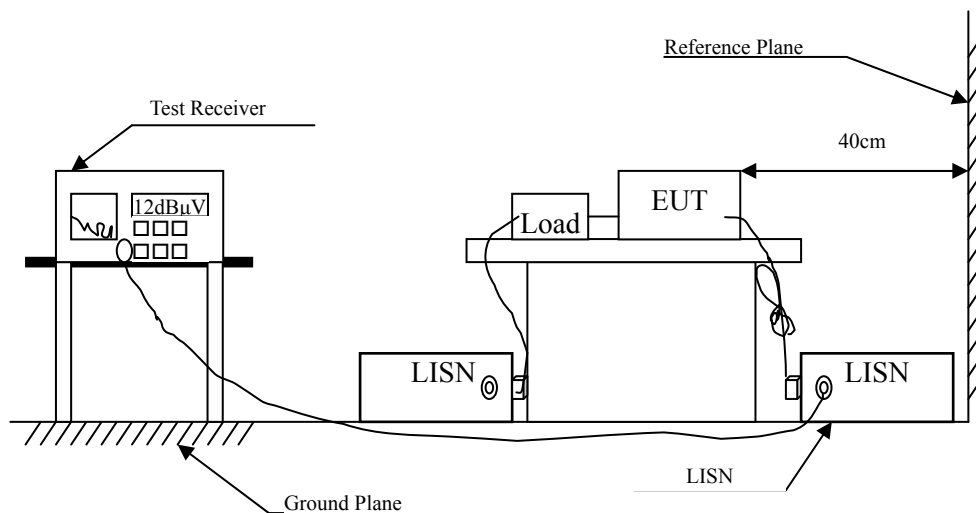
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Spectrum Analyzer	R&S	FSP40	100170	2016/1/5	2017/1/4
X	Bi-Log Antenna	Schaffner Chase	CBL6112B	2707	2016/9/10	2017/9/9
X	Horn Antenna	ETS-Lindgren	3117	00135205	2016/4/6	2017/4/5
	Horn Antenna	Schwarzbeck	BBHA9170	9170430	2016/1/11	2017/1/10
X	Pre-Amplifier	QTK	AP/0100A	CHM/0901069	2016/6/28	2017/6/27
X	Pre-Amplifier	EMCI	EMC012630SE	980210	2016/1/27	2017/1/26
	Pre-Amplifier	NARDA WE	DBL-1840N506	013	2016/9/30	2017/9/29
X	Filter	MicroTRON	BRM50701	019	2016/10/20	2017/10/19
	Filter	Microwave Circuits	N0257881	36681	2015/12/7	2016/12/6
X	EMI Test Receiver	R&S	ESR26	101385	2016/9/29	2017/9/28
X	Coaxial Cable	QTK(Arnist)	SUCOFLEX 106	L1606-015C	2016/6/25	2017/6/24
X	EMI Test Receiver	R&S	ESCS 30	838251/001	2016/7/21	2017/7/20
X	Coaxial Cable	QTK(Arnist)	RG 214	LC003-RG	2016/6/21	2017/6/20
X	Coaxial signal switch	Anritsu	MP59B	6201415889	2016/6/16	2017/6/15

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBμV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

2.3. Test Procedure

The EUT and Peripherals are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

The EUT was setup to ANSI C63.4, 2014; tested to DTS test procedure of FCC KDB-558074 for compliance to FCC 47CFR Subpart C requirements.

2.4. Uncertainty

± 2.26 dB

2.5. Test Result of Conducted Emission

Product : zoomBox
Test Item : Conducted Emission Test
Power Line : Line 1
Test date : 2016/10/20
Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Frequency MHz	Correct Factor dB	Reading Level dB μ V	Measurement Level dB μ V	Margin dB	Limit dB μ V
LINE 1					
Quasi-Peak					
0.166	9.683	24.060	33.743	-31.800	65.543
0.216	9.677	16.020	25.697	-38.417	64.114
0.316	9.670	21.510	31.180	-30.077	61.257
0.936	9.699	14.880	24.579	-31.421	56.000
3.576	9.772	12.830	22.602	-33.398	56.000
17.286	9.986	10.730	20.716	-39.284	60.000
Average					
0.166	9.683	10.750	20.433	-35.110	55.543
0.216	9.677	12.340	22.017	-32.097	54.114
0.316	9.670	14.400	24.070	-27.187	51.257
0.936	9.699	8.940	18.639	-27.361	46.000
3.576	9.772	6.550	16.322	-29.678	46.000
17.286	9.986	5.030	15.016	-34.984	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : zoomBox
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test date : 2016/10/20
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

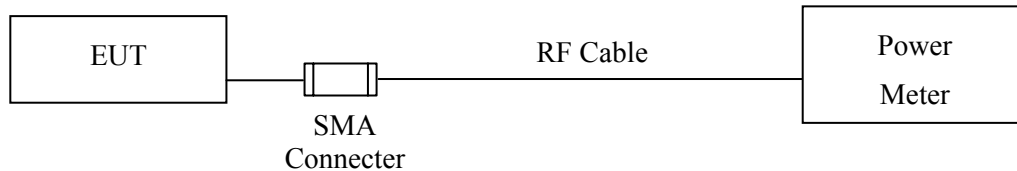
Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dB μ V	dB μ V	dB	dB μ V
LINE 2					
Quasi-Peak					
0.167	9.735	22.290	32.025	-33.489	65.514
0.317	9.740	16.780	26.520	-34.709	61.229
1.407	9.774	9.230	19.004	-36.996	56.000
5.227	9.871	8.480	18.351	-41.649	60.000
18.807	10.182	7.450	17.632	-42.368	60.000
28.927	10.599	9.590	20.189	-39.811	60.000
Average					
0.167	9.735	9.890	19.625	-35.889	55.514
0.317	9.740	8.200	17.940	-33.289	51.229
1.407	9.774	3.470	13.244	-32.756	46.000
5.227	9.871	2.160	12.031	-37.969	50.000
18.807	10.182	4.050	14.232	-35.768	50.000
28.927	10.599	4.630	15.229	-34.771	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " " means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

3. Peak Power Output

3.1. Test Setup



3.2. Limit

The maximum peak power shall be less 1Watt.

3.3. Test Procedure

Tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements. The maximum peak conducted output power using KDB 558074 section 9.1.3 PKPM1 Peak power meter method.

3.4. Uncertainty

± 1.19 dB

3.5. Test Result of Peak Power Output

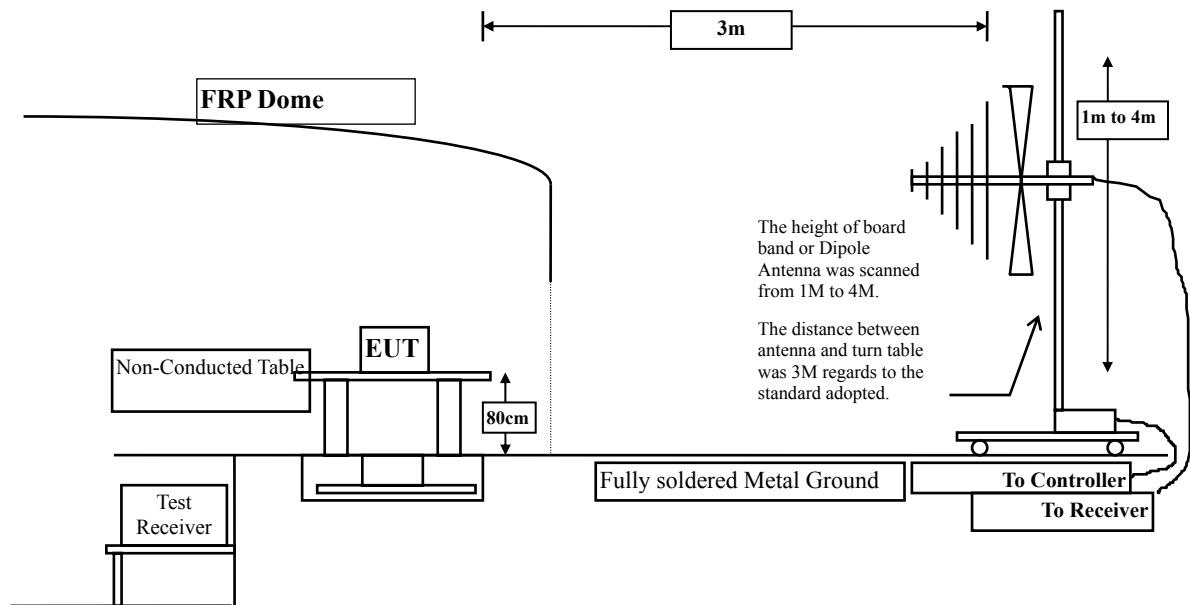
Product : zoomBox
 Test Item : Peak Power Output
 Test Site : No.3 OATS
 Test date : 2016/10/19
 Test Mode : Mode 1: Transmit - BLE (GFSK)

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	9.83	1 Watt= 30 dBm	Pass
Channel 19	2440.00	10.51	1 Watt= 30 dBm	Pass
Channel 39	2480.00	8.92	1 Watt= 30 dBm	Pass

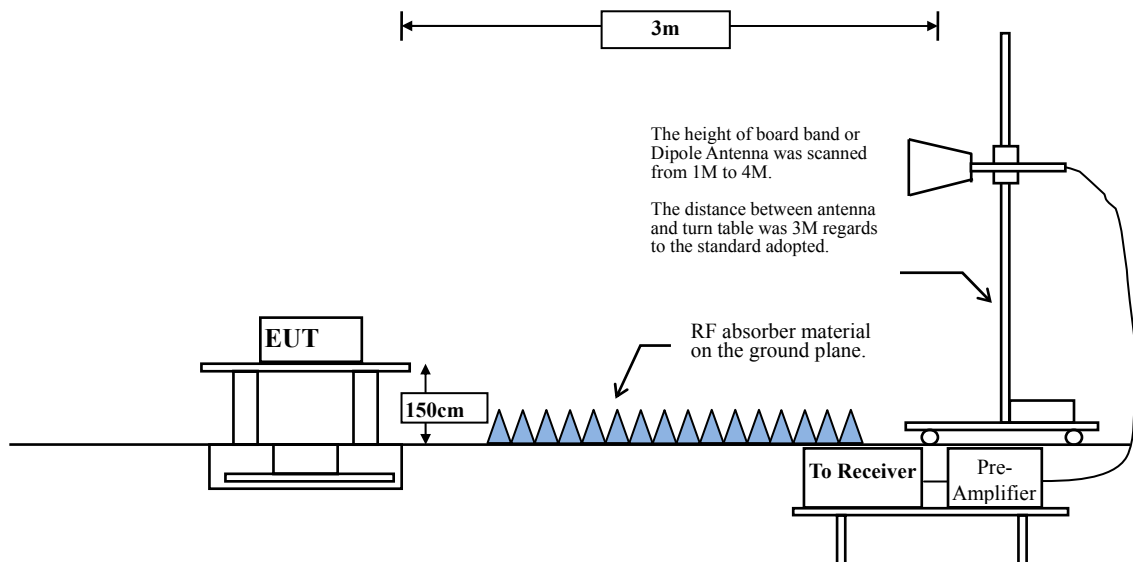
4. Radiated Emission

4.1. Test Setup

Below 1GHz



Above 1GHz



4.2. Limits

➤ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

- Remarks:
1. RF Voltage (dB μ V) = 20 log RF Voltage (uV)
 2. In the Above Table, the tighter limit applies at the band edges.
 3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

4.3. Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground, when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

4.4. Uncertainty

± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

4.5. Test Result of Radiated Emission

Product : zoomBox
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test date : 2016/10/24
Test Mode : Mode 1: Transmit - BLE (GFSK)(2402MHz)

Frequency MHz	Correct Factor dB	Reading Level dBμV	Measurement Level dBμV/m	Margin dB	Limit dBμV/m
Horizontal					
Peak Detector:					
4804.000	0.269	39.938	40.207	-33.793	74.000
7206.000	5.710	37.369	43.079	-30.921	74.000
9608.000	11.093	36.960	48.053	-25.947	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4804.000	0.269	39.320	39.589	-34.411	74.000
7206.000	5.710	37.615	43.325	-30.675	74.000
9608.000	11.093	36.772	47.865	-26.135	74.000
Average Detector:					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : zoomBox
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test date : 2016/10/24
Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Frequency MHz	Correct Factor dB	Reading Level dB μ V	Measurement Level dB μ V/m	Margin dB	Limit dB μ V/m
Horizontal					
Peak Detector:					
4880.000	0.133	39.388	39.521	-34.479	74.000
7320.000	5.855	40.189	46.044	-27.956	74.000
9760.000	11.990	36.151	48.141	-25.859	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4880.000	0.133	39.728	39.861	-34.139	74.000
7320.000	5.855	37.972	43.827	-30.173	74.000
9760.000	11.990	36.555	48.545	-25.455	74.000
Average Detector:					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : zoomBox
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2016/10/24
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector:					
4960.000	0.391	39.467	39.858	-34.142	74.000
7440.000	7.348	38.102	45.449	-28.551	74.000
9920.000	12.903	36.902	49.806	-24.194	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4960.000	0.391	38.792	39.183	-34.817	74.000
7440.000	7.348	37.134	44.481	-29.519	74.000
9920.000	12.903	36.977	49.881	-24.119	74.000
Average Detector:					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : zoomBox
 Test Item : General Radiated Emission
 Test Site : No.3 OATS
 Test date : 2016/10/24
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

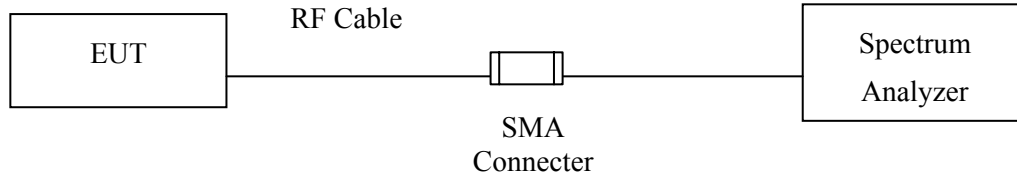
Frequency MHz	Correct Factor dB	Reading Level dB μ V	Measurement Level dB μ V/m	Margin dB	Limit dB μ V/m
Horizontal					
504.330	2.015	36.019	38.034	-7.966	46.000
551.860	3.390	33.843	37.233	-8.767	46.000
607.150	4.066	33.714	37.780	-8.220	46.000
696.390	3.367	42.414	45.781	-0.219	46.000
828.310	7.374	30.265	37.639	-8.361	46.000
911.730	6.471	30.634	37.105	-8.895	46.000
Vertical					
381.140	0.816	24.042	24.858	-21.142	46.000
503.360	-0.086	26.636	26.550	-19.450	46.000
609.090	2.135	25.958	28.093	-17.907	46.000
696.390	1.047	40.721	41.768	-4.232	46.000
819.580	3.001	25.333	28.334	-17.666	46.000
922.400	3.200	23.721	26.921	-19.079	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.
8. No emission found between lowest internal used/generated frequency to 30MHz.

5. RF Antenna Conducted Test

5.1. Test Setup



5.2. Limits

According to FCC Section 15.247(d). In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

5.3. Test Procedure

The EUT was tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

5.4. Uncertainty

$\pm 1.20\text{dB}$

5.5. Test Result of RF Antenna Conducted Test

Product : zoomBox
Test Item : RF Antenna Conducted Test
Test Site : No.3 OATS
Test date : 2016/10/20
Test Mode : Mode 1: Transmit - BLE (GFSK)

Figure Channel 00:

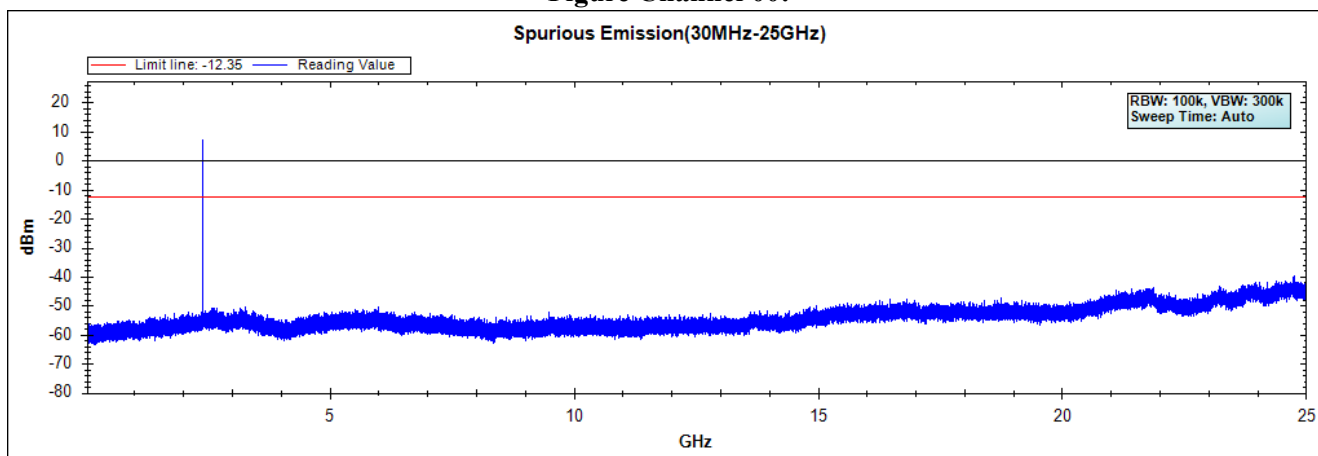


Figure Channel 19:

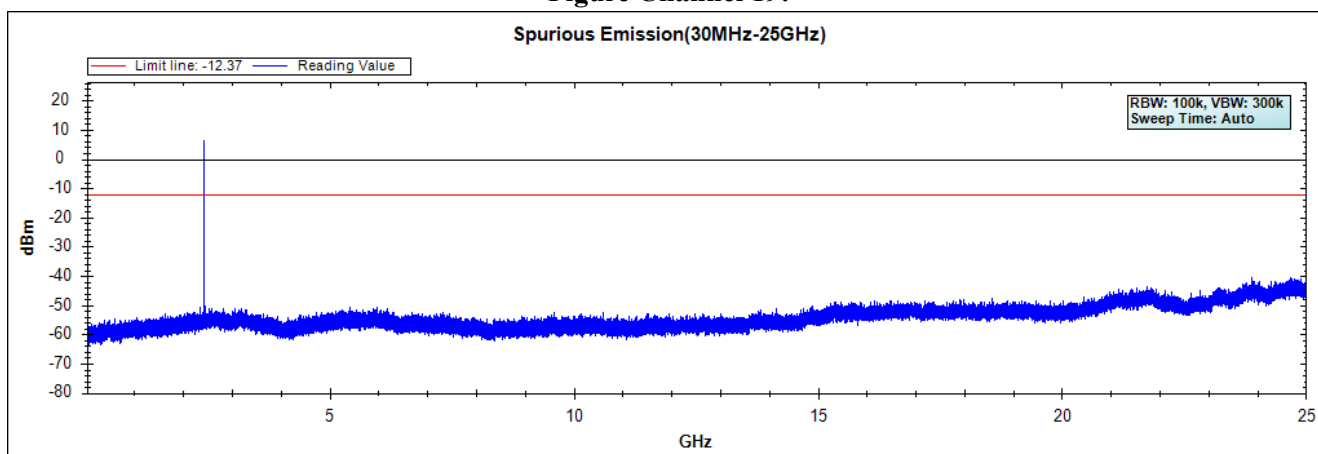
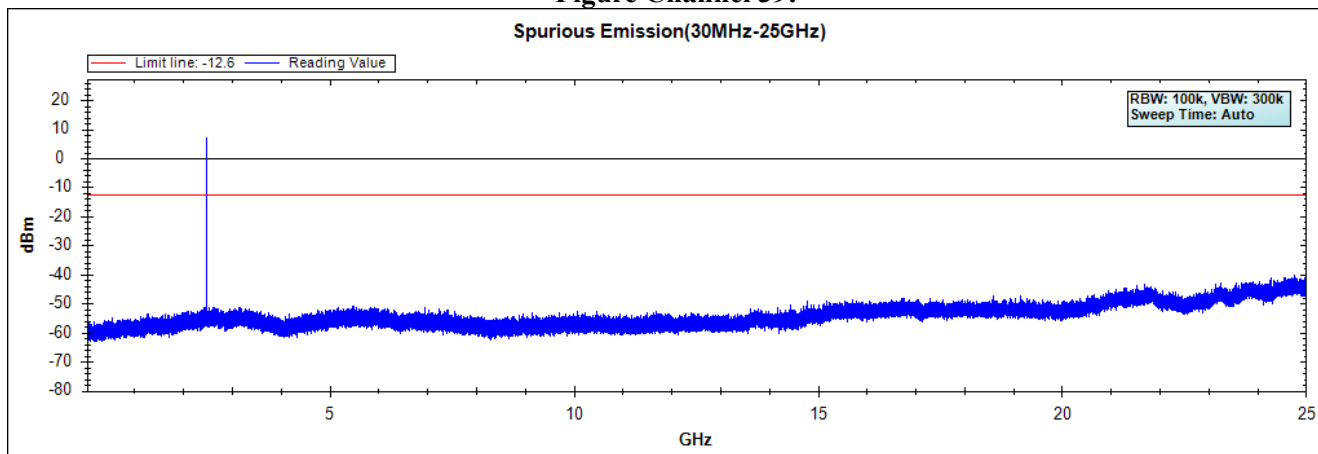


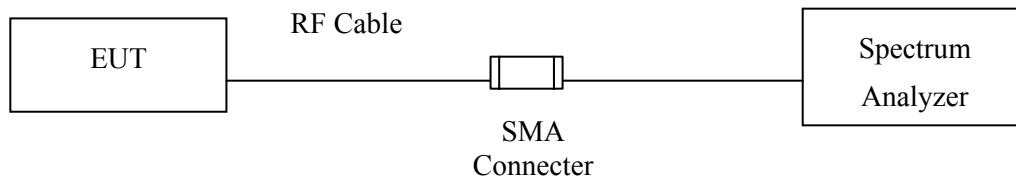
Figure Channel 39:



6. Band Edge

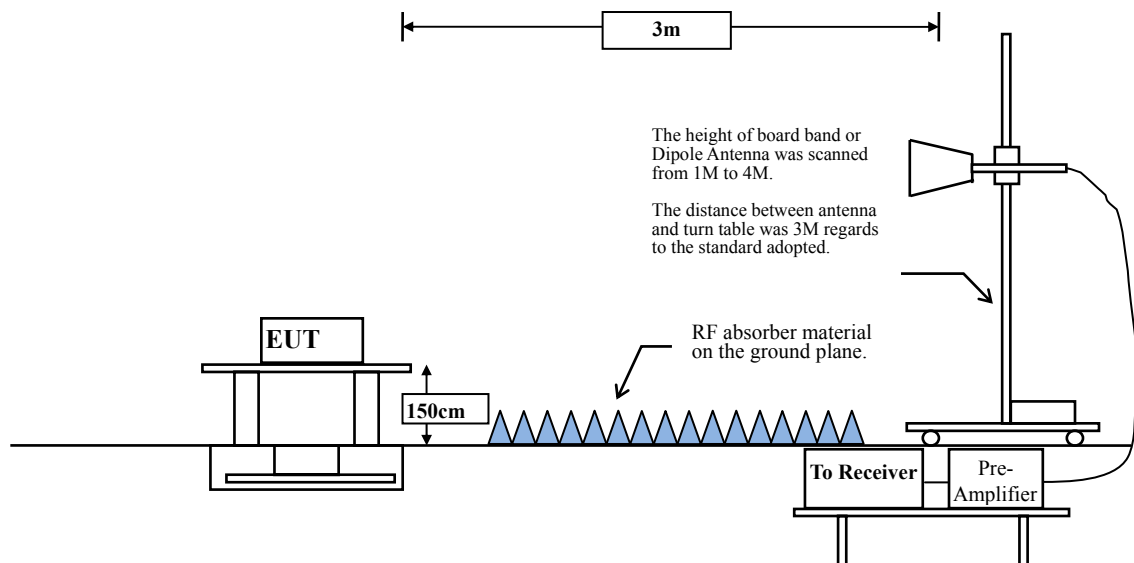
6.1. Test Setup

RF Conducted Measurement



RF Radiated Measurement:

Above 1GHz



6.2. Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.

6.4. Uncertainty

± 4.08 dB above 1GHz
± 4.22 dB below 1GHz

6.5. Test Result of Band Edge

Product : zoomBox
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2016/10/20
Test Mode : Mode 1: Transmit - BLE (GFSK)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
00 (Peak)	2388.400	6.468	47.319	53.787	74.000	54.000	Pass
00 (Peak)	2390.000	6.474	45.255	51.730	74.000	54.000	Pass
00 (Peak)	2400.000	6.528	69.092	75.620	--	--	--
00 (Peak)	2402.000	6.540	98.410	104.950	--	--	--
00 (Average)	2390.000	6.474	33.814	40.289	74.000	54.000	Pass
00 (Average)	2400.000	6.528	46.352	52.880	74.000	54.000	Pass
00 (Average)	2402.000	6.540	74.946	81.486	--	--	--

Figure Channel 00:

Horizontal (Peak)

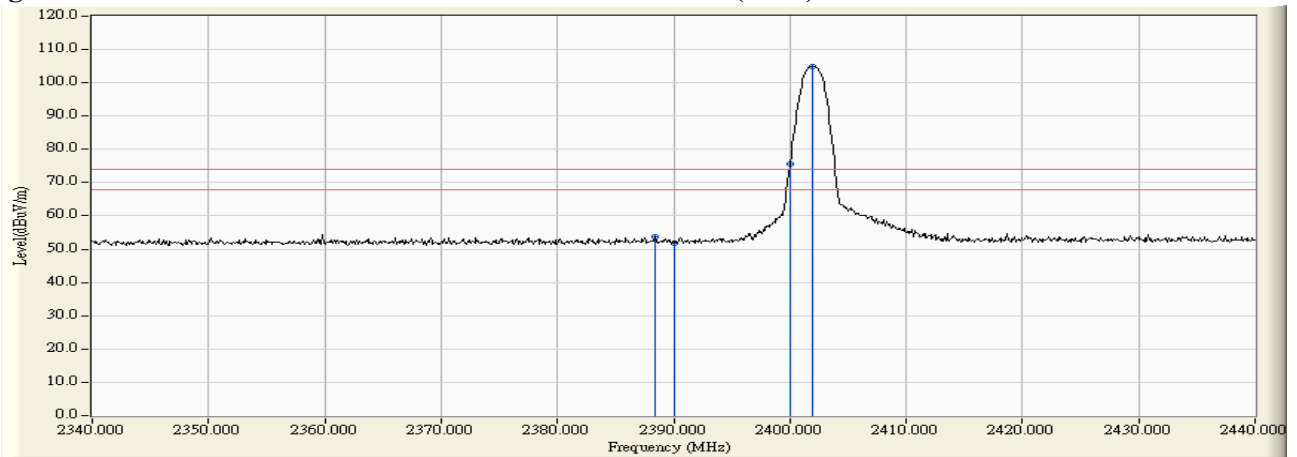
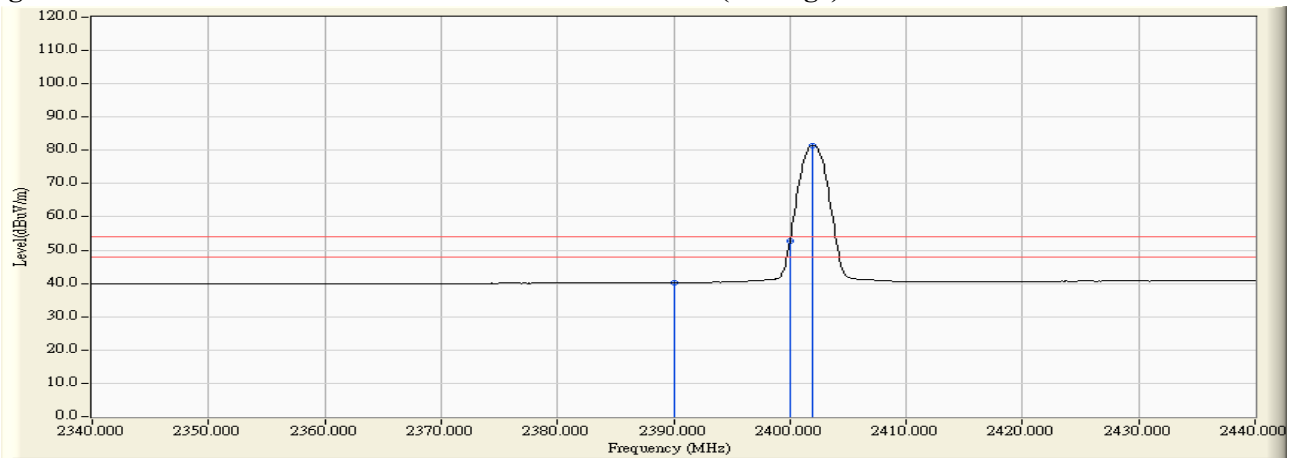


Figure Channel 00:

Horizontal (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : zoomBox
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2016/10/20
Test Mode : Mode 1: Transmit - BLE (GFSK)

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
00 (Peak)	2389.000	5.885	47.058	52.943	74.000	54.000	Pass
00 (Peak)	2390.000	5.880	46.777	52.658	74.000	54.000	Pass
00 (Peak)	2400.000	5.879	58.629	64.508	74.000	54.000	Pass
00 (Peak)	2402.000	5.884	87.672	93.556	--	--	--
00 (Average)	2376.100	5.938	33.816	39.754	74.000	54.000	Pass
00 (Average)	2390.000	5.880	33.734	39.615	74.000	54.000	Pass
00 (Average)	2400.000	5.879	40.631	46.510	74.000	54.000	Pass
00 (Average)	2402.000	5.884	67.767	73.651	--	--	--

Figure Channel 00:

Vertical (Peak)

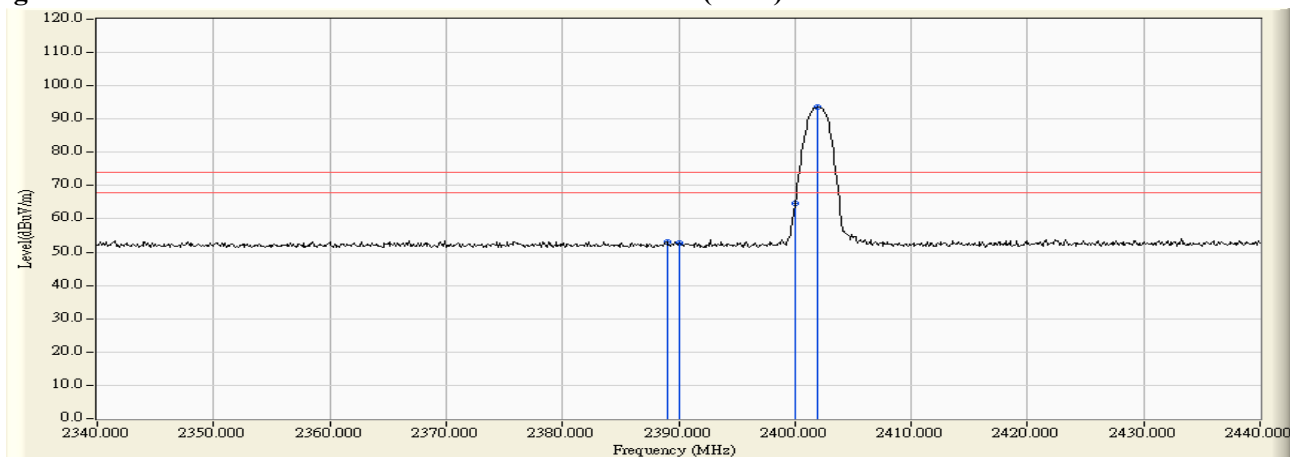
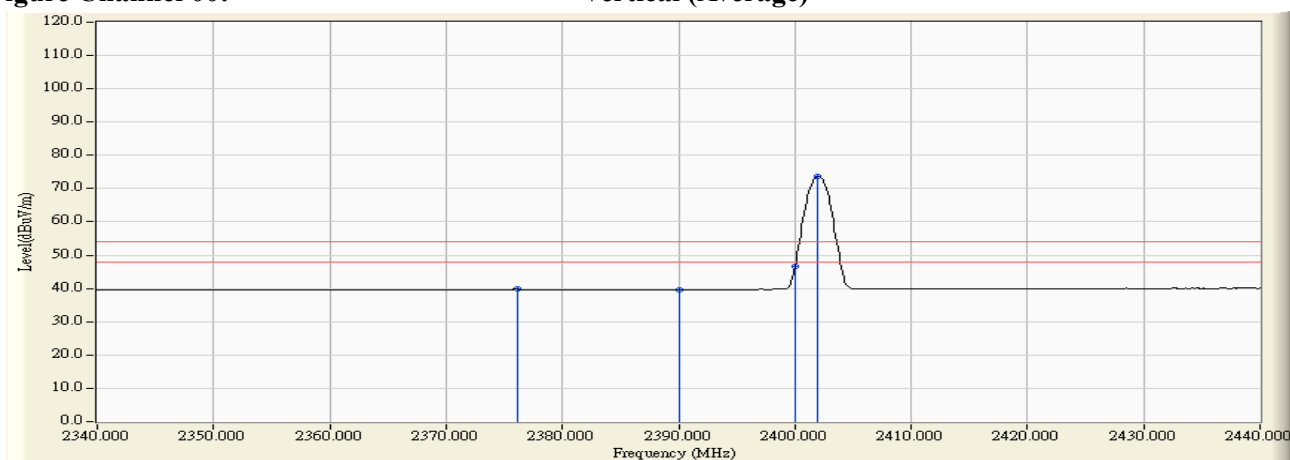


Figure Channel 00:

Vertical (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : zoomBox
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2016/10/20
Test Mode : Mode 1: Transmit - BLE (GFSK)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
39 (Peak)	2480.000	7.085	95.793	102.878	--	--	--
39 (Peak)	2483.500	7.110	56.285	63.395	74.000	54.000	Pass
39 (Average)	2480.000	7.085	73.093	80.178	--	--	--
39 (Average)	2483.500	7.110	33.982	41.092	74.000	54.000	Pass

Figure Channel 39: Horizontal (Peak)

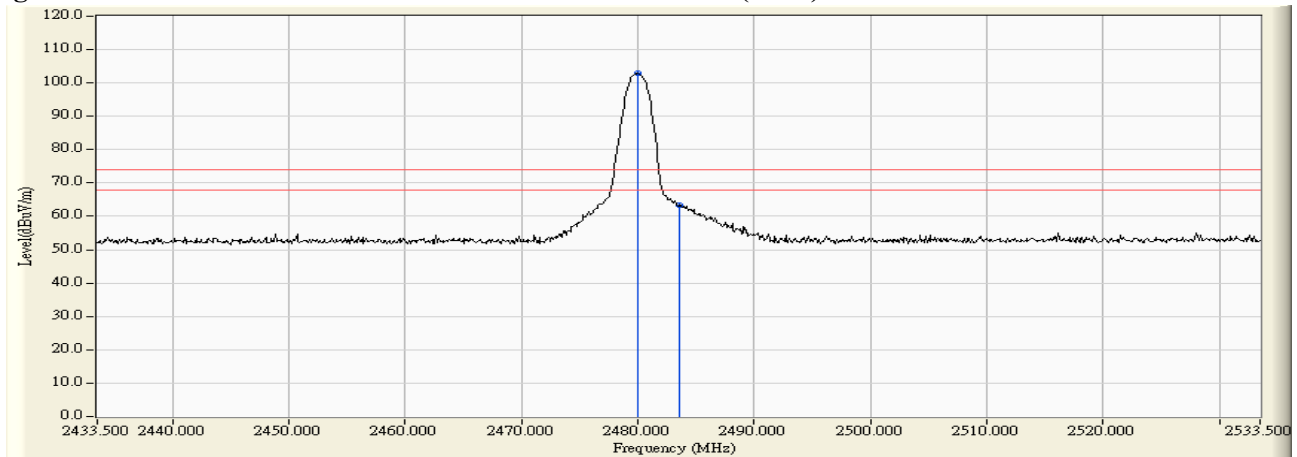
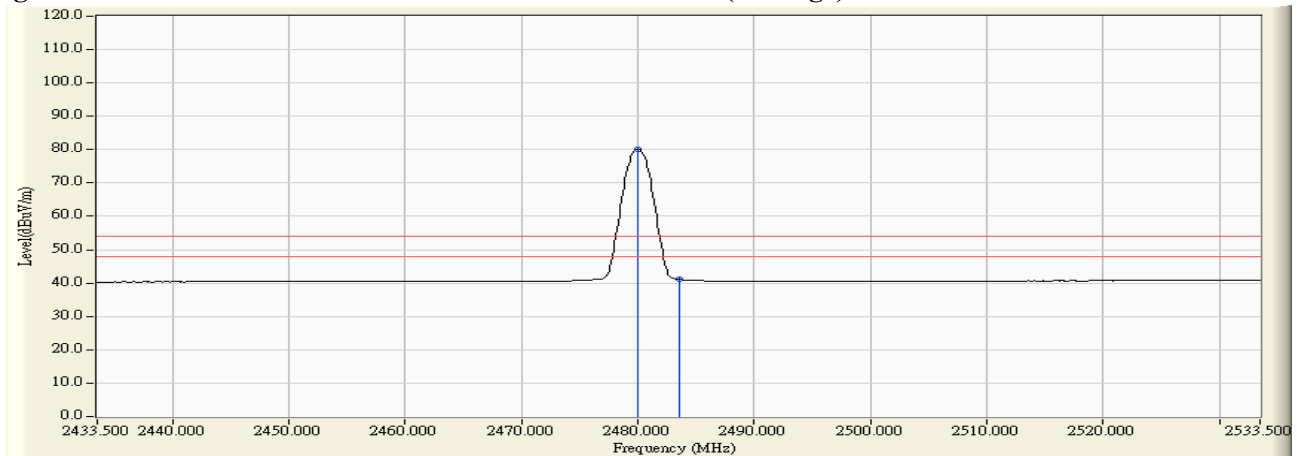


Figure Channel 39: Horizontal (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : zoomBox
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2016/10/20
Test Mode : Mode 1: Transmit - BLE (GFSK)

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
39 (Peak)	2478.500	6.332	89.253	95.585	--	--	--
39 (Peak)	2483.500	6.363	47.473	53.836	74.000	54.000	Pass
39 (Average)	2478.500	6.332	68.667	74.999	--	--	--
39 (Average)	2483.500	6.363	33.449	39.812	74.000	54.000	Pass

Figure Channel 39: Vertical (Peak)

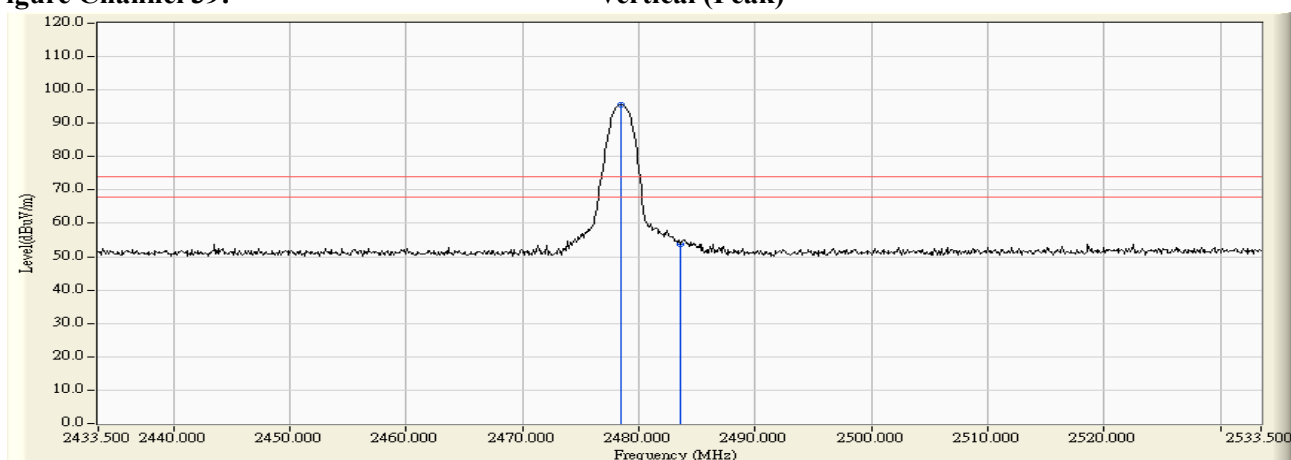
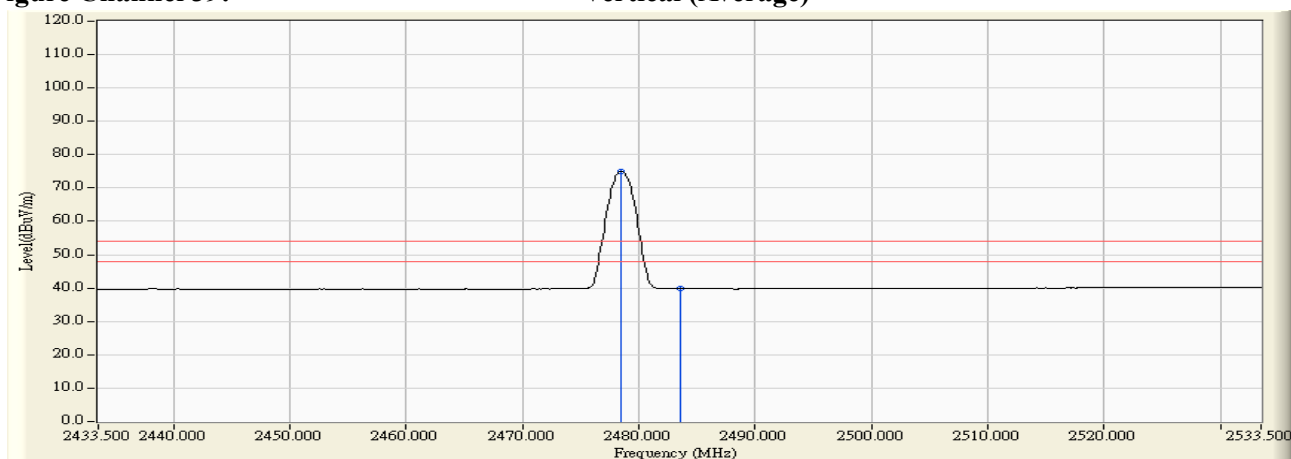


Figure Channel 39: Vertical (Average)

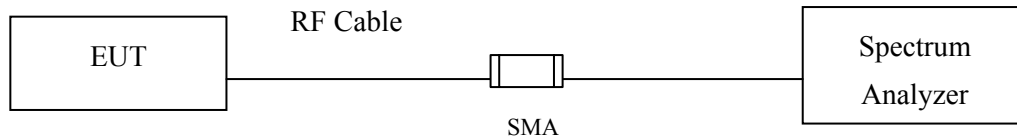


Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

7. 6dB Bandwidth

7.1. Test Setup



7.2. Limits

The minimum bandwidth shall be at least 500 kHz.

7.3. Test Procedure

The EUT was setup according to ANSI C63.10 2013; tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 1-5% of the emission bandwidth, $VBW \geq 3 \cdot RBW$

7.4. Uncertainty

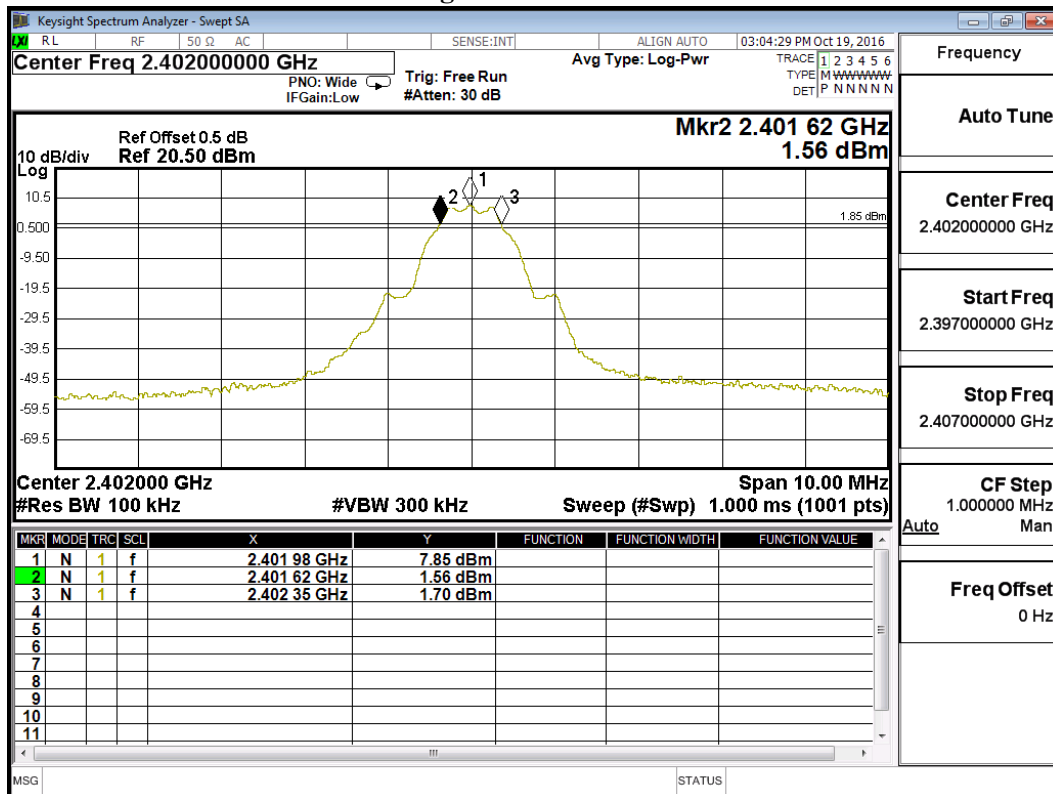
$\pm 283\text{Hz}$

7.5. Test Result of 6dB Bandwidth

Product : zoomBox
Test Item : 6dB Bandwidth Data
Test Site : No.3 OATS
Test date : 2016/10/19
Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	730.0	>500	Pass

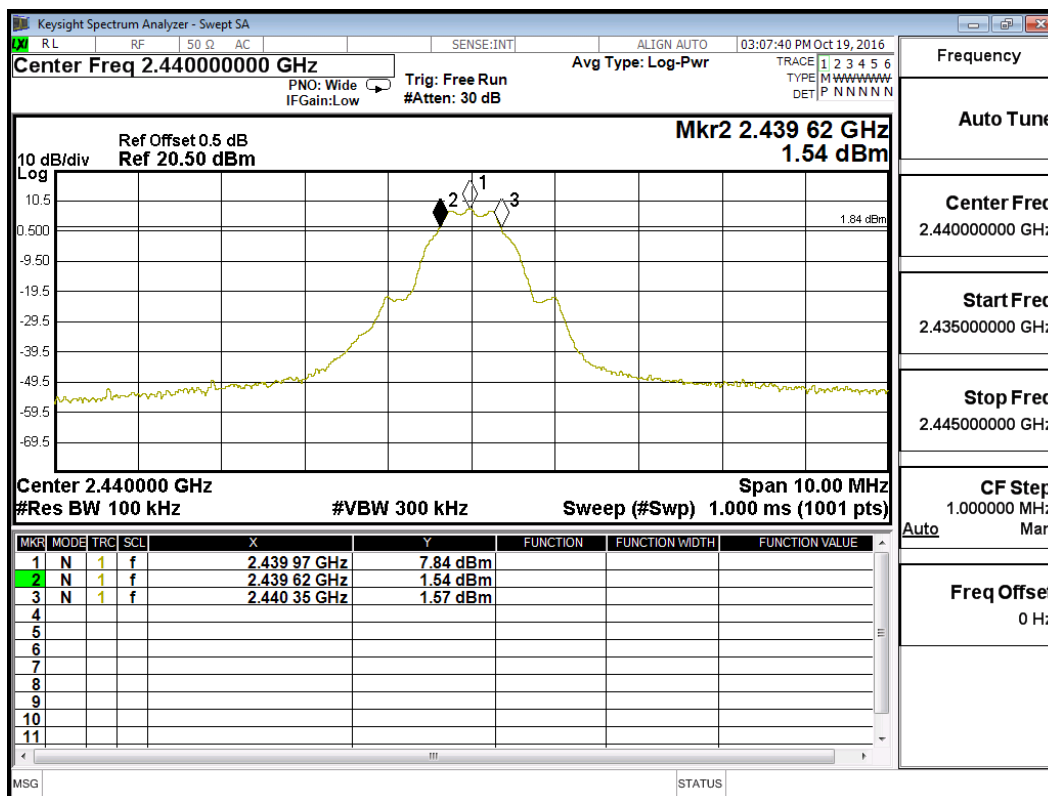
Figure Channel 00:



Product : zoomBox
 Test Item : 6dB Bandwidth Data
 Test Site : No.3 OATS
 Test date : 2016/10/19
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
19	2440	730.0	>500	Pass

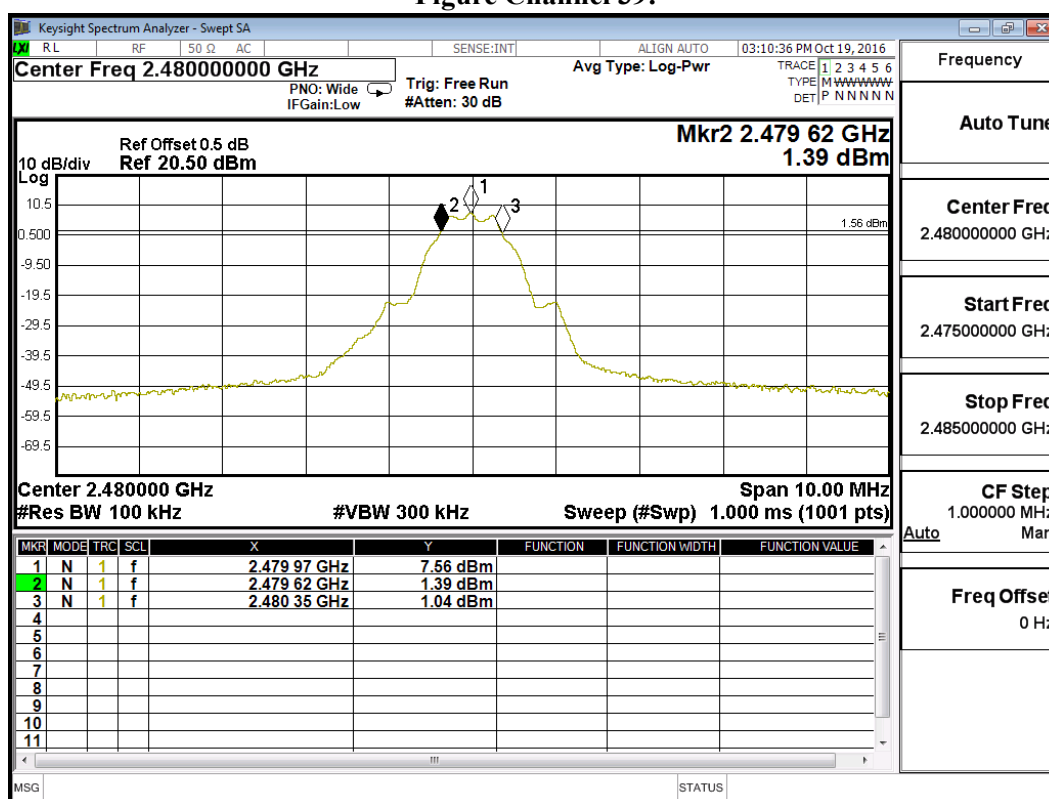
Figure Channel 19:



Product : zoomBox
Test Item : 6dB Bandwidth Data
Test Site : No.3 OATS
Test date : 2016/10/19
Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

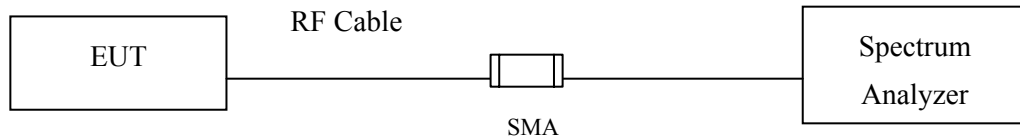
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
39	2480	730.0	>500	Pass

Figure Channel 39:



8. Power Density

8.1. Test Setup



8.2. Limits

The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3kHz bandwidth.

8.3. Test Procedure

The EUT was setup according to ANSI C63.10: 2013, the maximum power spectral density using KDB 558074 section 10.2 PKPSD (peak PSD) method.

8.4. Uncertainty

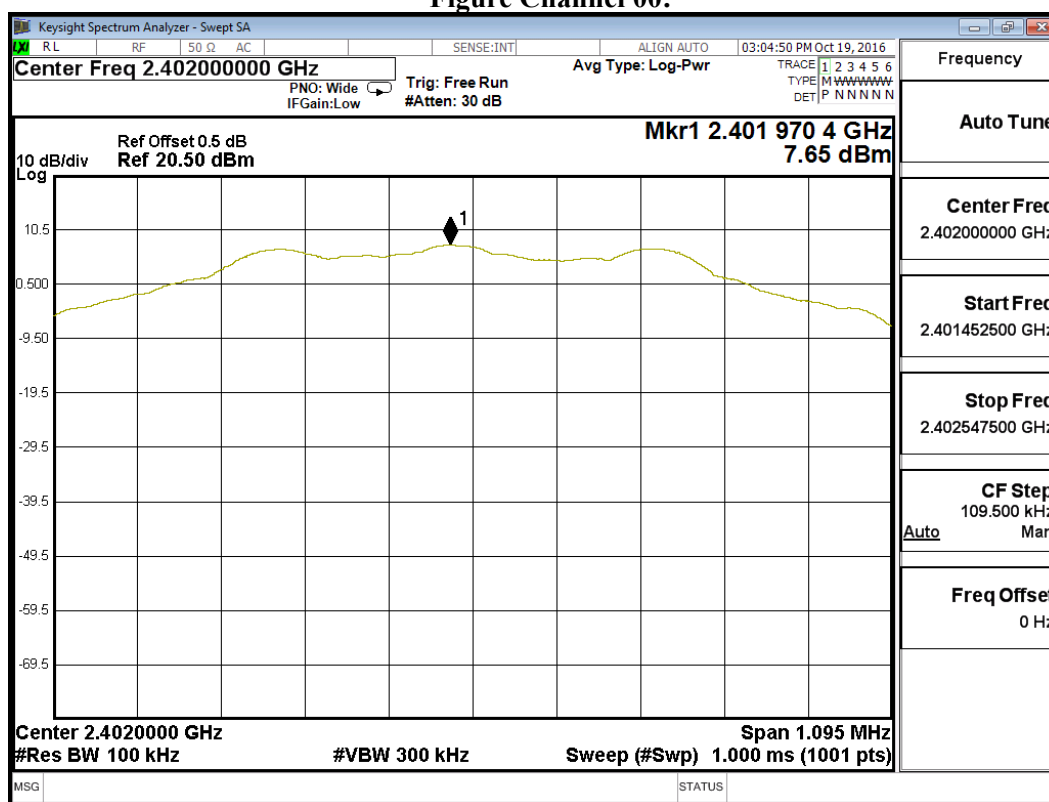
± 1.20 dB

8.5. Test Result of Power Density

Product : zoomBox
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test date : 2016/10/19
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402	7.650	$\leq 8\text{dBm}$	Pass

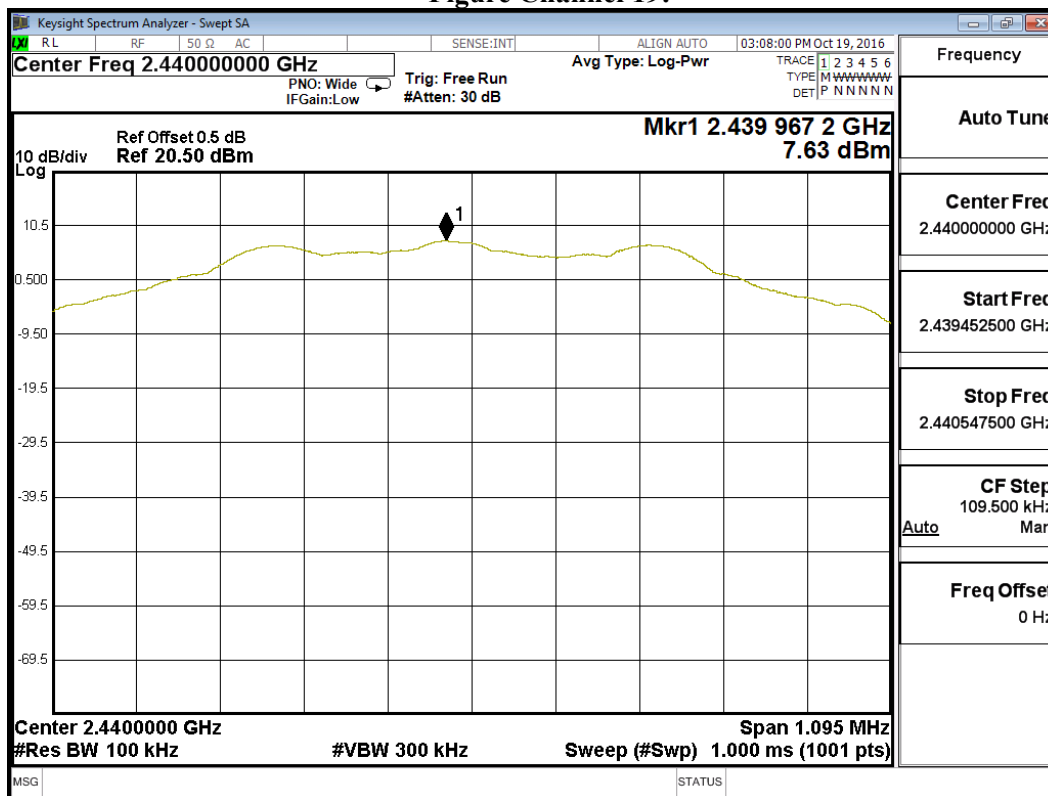
Figure Channel 00:



Product : zoomBox
 Test Item : Power Density Data
 Test Site : No.3OATS
 Test date : 2016/10/19
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
19	2440	7.630	$\leq 8\text{dBm}$	Pass

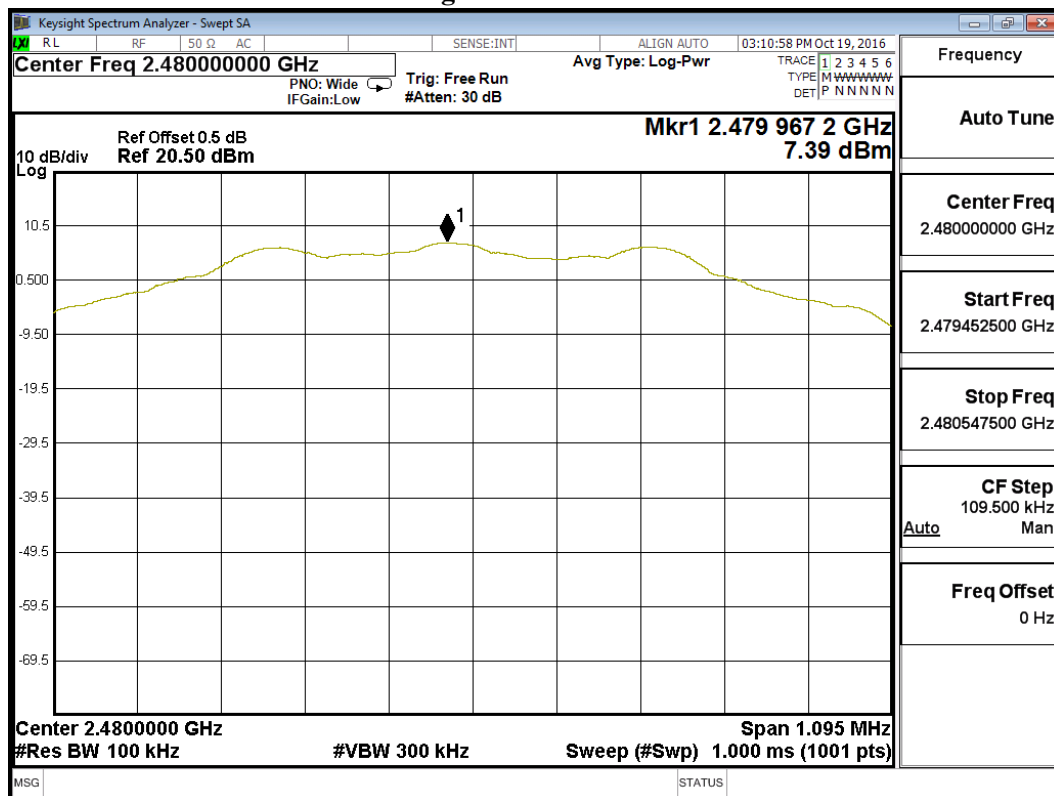
Figure Channel 19:



Product : zoomBox
Test Item : Power Density Data
Test Site : No.3 OATS
Test date : 2016/10/19
Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
39	2480	7.390	≤ 8 dBm	Pass

Figure Channel 39:



9. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs